

filtered by a perceptual weighting synthesis filter
 607 to generate a synthesized signal $p(t,n)$. The
 adaptive vector $q(t,n)$ by which an error between this
 synthesized signal $p(t,n)$ and a target signal $r(n)$
 5 obtained by filtering an input speech signal through a
 perceptual weighting filter 608 becomes minimum is
 searched. This equals to searching for the adaptive
 vector $q(t,n)$ that the result of the equation (29)
 becomes maximum.

10

$$\text{cntb}(t) = \frac{\left(\sum_{n=0}^{\text{NSF}-1} r(n)p(t,n) \right)^2}{\sum_{n=0}^{\text{NSF}-1} p(t,n)^2} \quad \dots (29)$$

Of all the candidates of the pitch period t
 included in the search range, the pitch period t
 corresponding to the maximum contribution degree
 15 $\text{cntb}(t)$ is set as a subframe pitch period $ST(0)$, and a
 value obtained by subtracting a predicted subframe
 pitch period $STP(0)$ from the subframe pitch period
 $ST(0)$ is set as a relative pitch period $\Delta T(0)$.
 Processing of obtaining this relative pitch period
 20 $\Delta T(0)$ is performed for all subframes $sf(k)$ to obtain
 relative pitch periods $\Delta T(k)$ of all the subframes.

Finally, the information of the pitch period $T(0)$
 obtained by the pitch period analysis section 603 is
 output from an output terminal 612. The information of
 25 the relative pitch period $\Delta T(k)$ corresponding to the

selected.

This embodiment has the following effects.

Assume that relative pitch periods $\Delta T(k)$ are scalar-quantized in units of subframes. In this case, for example, if a search range $NR = 8$, three bits are required to express each pitch period, as described above. That is, 3 bits \times 4 subframes = 12 bits are required per frame to express the information of the relative pitch period $\Delta T(k)$.

In contrast to this, this embodiment has the relative pitch pattern codebook 905 having relative pitch period patterns with high frequencies of appearance as relative pitch patterns. Assume that one vector (four dimensions) is expressed by relative pitch periods $\Delta T(0)$ to $\Delta T(3)$ of four subframes $sf(0)$ to $sf(3)$, and the relative pitch pattern codebook 905 is constituted by 128 (7 bits) types of relative pitch patterns. In this case, the relative pitch periods $\Delta T(k)$ of four subframes can be expressed by 7 bits, which have been expressed by 12 bits. That is, a great reduction in the number of bits can be attained.

The relative pitch pattern codebook 905 has J types of representative relative pitch patterns $pv(j)$ given in advance by:

$$pv(j) = \{v(j, k); k = 0 \text{ to } k-1\} \quad \dots (31) \\ (0 \leq j \leq J-1)$$

An adder 913 adds a predicted subframe pitch period $STP(k)$ and the j th relative pitch pattern $pv(j)$